

the placenta had degenerated into a substance resembling cartilage, of a grayish-white colour; on the uterine surface it was still spongy and porous in several spots. In Feb. 1846, the same woman was again arrived near the time of her delivery. She stated that a month previously she had had a slight attack of fever, after which she was seized with severe pain in the right side of the belly, in which part she felt as if there were a weighty stone lying within her; at the same time she suffered from thirst, sleeplessness, headache, and loss of appetite. Subsequently she was troubled at various times with bloody, watery, and purulent discharges from the vagina.

On the 26th Feb., the pulsation of the fœtal heart could not be heard, nor could any movements of the child be felt by the mother or her medical attendant; and at the same time she complained of nausea and a sensation of cold in the belly. Some days after, she was delivered very quickly of a child which appeared to have been long dead. The placenta was circular, curled inwards at the edges, grayish-yellow in colour. On the fœtal surface it was dark brown or almost black; and it was so indurated as not to bend when held out by one point.—*Ibid.*, from *Schmid's Jahrbucher*, 1847.

ANÆSTHETIC AGENTS.

[Anæsthetic agents have now been used very extensively in surgical operations and midwifery practice, as also in several morbid conditions of the nervous system. It would be impossible for us to notice all the cases in which they have been employed, reported in the various medical journals;—it will be sufficient to state, that they have been resorted to in almost every description of surgical operation, and in perhaps all the varieties of labour.

We have before us a note from Mr. Lawrence to our esteemed colleague, Professor Warren, of Boston, in which that distinguished surgeon states, that ether inhalation has been used in St. Bartholomew's Hospital, in all descriptions of operative proceedings, from the slightest to the most serious, between two and three thousand times, without a single unpleasant result.

Under these circumstances, we conceive that we shall best subserve the interests of our science and of humanity, by confining our notices principally to the facts which have been brought forward illustrative of the physiological action of these agents, and of the cases in which injurious or fatal consequences have resulted from their use, in order to elucidate, as far as possible, the conditions which forbid their use, and to inculcate more caution than has hitherto been observed in the employment of these very powerful articles.]

43. *Physiological Action of Chloroform and Ether on Animals*—M. GRUBY, in a communication to the Academy of Sciences, announces that the effects of chloroform vapour on dogs and rabbits are as follows:—"1. That during inspiration the arterial blood retains its florid colour, and if, under a-phylxia, it assumes the dark venous character, the red colour is speedily restored. 2. That a part of the animal, a limb for example, separated from the body, and exposed to chloroform or ether vapour, becomes insensible. 3. That if the member be removed from the vapour, sensibility is restored. 4. That during the inspiration of chloroform vapour, the number of respirations increases with the degree of insensibility produced. 5. That animals may be kept in a state of insensibility for several hours, and afterwards restored, if the inspiration of the vapour be occasionally interrupted. 6. That on the other hand, rabbits, dogs, and frogs, die suddenly in from one to four minutes after respiring the vapour, if the dose of chloroform is from 46 to 60 grains, and the inhalation be uninterrupted."—(*Medical Gazette*, December 24, 1847.)

Mr. Thomas Wakley has performed an extensive series of experiments with chloroform and ether on the lower animals (dogs, cats, rabbits, rats, mice, pigs, hedgehogs, horses, and birds). The chloroform and ether were administered by inhalation. Mr. Wakley's researches show:

1. That there is no important difference in the effects of chloroform when inhaled by the various animals above enumerated.

2. In fatal experiments with the chloroform, the symptoms were quickrearing, muscular weakness, showing itself first, as generally happens, in the hind legs, foaming at the mouth, dilatation of the pupil, and congestion of the conjunctiva. As the experiment advanced, the breathing became slow and laborious, there was complete insensibility and muscular prostration, loss of reflex action (indicated by the absence of winking on irritating the cornea), and, finally, death by asphyxia, the heart's action continuing for some minutes after the cessation of the respiration. Death occurred in a period varying from three to eleven or more minutes, according to the strength of the animal, or the amount of chloroform used.

The post-mortem appearances are not mentioned in connection with the experiments; but in a concluding remark, the author states that intense venous congestion was found in the lungs, heart, and great vessels.

3. The symptoms, as well as the post-mortem appearances, enjoin caution in administering the chloroform to individuals labouring under congestion of the lungs, or any disease of the heart, or great vessels, which obstructs the free circulation of the blood. It has yet to be shown whether in such cases we might not obtain the anæsthetic effects without the engorgement of the lungs by the introduction of the vapour into the rectum.

4. The chloroform acts with greater energy in young and weakly; than in old and strong animals. Thus, in experiment 9, a strong dog, though made to inhale three drachms during eleven minutes, recovered readily, while in experiment 12, a weakly puppy, about eight months old, died from the effects of inhaling one drachm during three and a half minutes. This fact is important in a practical point of view, as, undoubtedly, great caution ought to be observed in administering chloroform to very weak individuals, or to young children, in whom it will probably be found that a much smaller quantity than is usually necessary, will be sufficient to induce the anæsthetic sleep.

5. The animals offered much less resistance to the administration of chloroform than to that of ether; indeed, they even seemed to like the former.—(*Lancet*, January 1, 1848.)

We are still in want of a series of experiments illustrating the action of chloroform when introduced into the lungs, stomach, rectum, cellular tissue, serous cavities, and blood-vessels. It should be used both in the state of vapour and of liquid. It is in this way alone, that we shall ever be able to arrive at a knowledge of its *modus operandi*.—(*Monthly Journ. and Retrospect of the Med. Sciences*, February, 1848.)

MM. GERARDIN and VERRIER have communicated to the French Academy an account of some carefully performed experiments on animals with ether and chloroform. In one of these experiments, pieces of sponge containing about 15 grammes of chloroform were placed in the nostrils of a horse, in such a manner as to allow free access of air during respiration. In two minutes the animal tottered on his legs, but retained sensation, and shortly recovered. A fresh quantity of chloroform, amounting also to about 15 grammes, was then employed, and insensibility was thereby eventually induced, but not until after seventeen minutes. The pulse remained quiet and regular, the respiration natural. The most painful operations were performed without the slightest appearance of consciousness. One of the carotid arteries was kept exposed during the experiment, but at no period could there be detected any change in the characters of the contained blood. In four or five minutes the horse recovered, and commenced eating.

The manifest inferiority of ether as an anæsthetic agent was well illustrated in another experiment. Sponges soaked with about 30 grammes of ether were inserted, as in the last experiment, into the nostrils of a young colt. After the consumption of this quantity the supply of ether was continually renewed, until 360 grammes were consumed, and the inhalation had continued for three quarters of an hour. But during the whole of this time no change in the animal ensued beyond a slight variation in the pulse, and some dilatation of the pupils: sensibility continued perfect; and there was no alteration in the characters of the arterial blood.

Another set of experiments were performed for the purpose of ascertaining the comparative effects of chloroform and ether, when inhaled as vapours with a large

quantity of air, and of the same agents when introduced in the liquid state into the circulation. In the experiments with the vapour of these fluids, the animals were confined in a large wooden box, perforated with apertures, to allow of the free access of air, while the vapour was introduced through a tube communicating with a vessel filled with the fluid, and immersed in a sand-bath. A cat introduced into this apparatus, and subjected to the vapour of ether, in three minutes became attacked with sneezings: in about eight minutes it fell down, and became convulsed; and in eleven minutes was completely insensible. On removing it from the box, and cutting its ears, clear bright blood flowed from them. The insensibility lasted for four minutes and a half. The animal gradually recovered, but continued apparently intoxicated, and unable to stand for a short time afterwards. About 40 grammes of ether were employed. A dog, similarly experimented upon with about 30 grammes of ether, became affected, and fell down comatose in less than two minutes. On being withdrawn from the apparatus, it recovered completely in four minutes. Blood obtained from wounds made during the continuance of the insensibility, had all the characters of ordinary arterial blood.

In one of the experiments performed with the view of ascertaining the effects of ether when introduced directly into the blood, 15 grammes of this fluid was introduced into the jugular vein of a horse. In 30 seconds the animal became dizzy, tottered, and then fell down. In one minute sensation was almost suspended, scarcely any signs of pain being given out on dividing the large plantar nerves. A strong odour of ether was exhaled with the breath. The capillaries contained perfectly bright oxygenated blood. Sensibility gradually returned, and the animal recovered in about six minutes. In an hour afterwards, another 30 grammes of ether were introduced into the jugular vein of the same horse. The preceding phenomena recurred with greater rapidity than before, and the insensibility was complete, and lasted for ten minutes. During the whole of this time the arterial blood underwent no apparent change. In another horse, five grammes of chloroform were introduced into the jugular vein: in fifteen minutes the animal appeared intoxicated, and staggered, having a vacant look, and the pupils considerably dilated. This condition lasted for about a minute, when the animal recovered. In a quarter of an hour afterwards, ten grammes of chloroform were introduced into the jugular of the same horse. In fifteen seconds the same phenomena occurred as before, and the animal now fell down. It moaned, was convulsed, and in one minute anæsthesia was complete: no change was observed in the arterial blood. The state of coma continued for about twelve minutes; then the animal gradually recovered, and began to eat.

From the results of their experiments, MM. Girardin and Verrier deduced that the vapour of ether and chloroform, when they are breathed with a due admixture of atmospheric air, do not act on the respiratory apparatus at all, but only on the nervous centres. They deduce, also, from the three last experiments, that ether and chloroform produce the same effects on the system when injected into the circulatory system, as when respired in the form of vapour: a much less quantity being required in the former than in the latter cases. When the fluids are introduced into the blood, the respiratory function is uninterfered with, nevertheless insensibility is manifested in the same manner as during inhalation, and the arterial blood undergoes no perceptible alteration. In the opinion of MM. Girardin and Verrier, ether and chloroform, therefore, exert a special and direct action upon the organs of sensation, and do not act after the manner of irrespirable gases. If asphyxia ever supervenes, it is only in consequence of deranged nervous action. Cases in which a dark colour of the arterial blood has been observed, are evidently those in which the inhalation has been continued after the production of insensibility, and in which asphyxia has been induced by an excess of the agent employed, or by a want of proper respirable air.

Several other observers, as well as MM. Girardin and Verrier, having doubted the correctness of M. Amussat's opinion, that the arterial blood undergoes any alteration in colour during the inhalation of the vapours of ether and of chloroform, M. Amussat has given an account of the process which he adopts in his experiments. Previous to inhalation, he exposes the blood-vessels and nerves at the upper part of the thigh, notices the difference in colour between the arterial

and venous blood, as perceived through the walls of the vessels, and examines the colour of the arterial blood by opening a small arterial branch near the knee, which he then closes by torsion. During inhalation, he states that a gradual change in hue of arterial blood, as seen through the coats of the arteries to that of the venous blood, may be observed; and when inhalation is carried so far that irritation of the nerves is followed by no muscular contractions, the colour of the arteries and veins is exactly the same, and blood procured from the former has the same dark appearance as that procured from the latter. On suspending the inhalation, the arteries speedily resume their characteristic and distinctive appearance. Large animals, such as dogs, should be employed in this experiment; not frogs, pigeons, or rabbits, whose blood-vessels are too small for the purpose.—*London Med. Gaz.*, Feb. 1848, from *Comptes Rendus*, Dec. 27, 1847.

44. *Physiological Action of Chloroform on Man*.—M. SEDILLOT has observed, that individuals enfeebled by age or disease, and those of temperate habits, are readily affected, and the insensibility is in them persistent. In strong and healthy individuals, and in those habituated to the use of alcoholic drinks, the anæsthesia is slowly produced, and endures for a short period.—*Month. Journ. and Retrospect*, March, 1848.

45. *Action of Chloroform, Ether and Benzin on the Nervous System*.—Dr. SNOW, in a paper read before the Westminster Medical Society, (Jan. 8th.) remarked that the action of chloroform and ether on the nervous system was essentially the same. He divides the effects of ether into five degrees, which may be called degrees of narcotism, instead of etherization, to make the description applicable to other vapours. The immunity from pain did not correspond exactly with the degrees of narcotism of the nervous centres, but was greater as the patient was recovering from the effects of the vapour, than in the corresponding degree, as he was getting under its influence; this was more particularly the case with ether, which he considered had superior anæsthetic effects to chloroform in proportion to the narcotism produced. When ether was inhaled, the patient sometimes completely recovered his mental faculties, whilst the insensibility to the operation continued. This curious phenomenon, he believed had not been explained. He had an hypothesis to offer concerning it to this effect—that it depended on etherization of the nerves of sensation, which continued for some little time, on account of the ether exuding through the coats of the capillaries into the extra vascular lymph of the tissues, and requiring some time to return into the circulation, and escape by the lungs. He had met with this persistence of insensibility to the knife chiefly in young subjects, in whom, connected with the greater activity of nutrition, there was more liquor sanguinis exterior to the vessels. In the brain there was but very little at any period of life. Chloroform probably permeated the coats of the vessels less easily, and he had not met with the symptom in question during its use.

Chloroform certainly possessed the advantage of being less pungent than ether, and was therefore more easily inhaled; it had also one or two other advantages. With respect to its greater rapidity of action, this was not an unalloyed advantage. Ether produced a full surgical degree of insensibility in the adult in four minutes on an average; it might be desirable to shorten this period to two minutes, but not to a shorter time; not only in order to afford opportunity for watching its effects, but also on account of a cumulative property in these vapours, hitherto not alluded to. The effect of them sometimes increased for twenty seconds after the inhalation was discontinued, and he thought it desirable to have six times this period, or two minutes, for producing complete insensibility, in order to avoid danger. But chloroform, when administered on a handkerchief or sponge, as recommended by Dr. Simpson, its introducer, sometimes produced complete insensibility in six or seven inspirations, as that gentleman stated. 100 cubic inches of vapour of chloroform contain 128 grs. of the liquid, a quantity he believed more than sufficient to cause death; and yet this quantity might be contained in 700 or 800 cubic inches of air, and might be all breathed in a quarter of a minute, by taking deep inspirations. Danger might, it was true, be probably avoided, by putting but a limited quantity on the handkerchief or sponge, but this